Notebook Series -- Pocket Notebooks
Notebook, PN-18-09-10.2

This pocket notebook, which covers the period September-October 1918, was used by Edison concurrently with PN-18-09-10.1. The entries in this book pertain primarily to war-related experiments conducted in the garage at Glenmont, Edison's home in Llewellyn Park, New Jersey; at the U.S. Naval Experiment Station in New London, Connecticut; and possibly at other locations on Long Island Sound. Included are notes on sound detection devices and other means of locating submarines. Also included are notes on camouflaging, poison gases, smoke generation, and the penetration of machine gun bullets. In addition, there are comments about the "possible source of noises on Cargo boats" and "possible means of detecting German 2 Knot noiseless subs," along with other remarks about underwater acoustics. A few of the entries relate to the production of disc records. Pinned into the front of the book is a letter of introduction from Secretary of the Navy Josephus Daniels, addressed to the "Commandants of Navy Yards." Among the employees mentioned in the book are experimenters James M. Burns, John A. Hanley, William A. Hayes, and Paul D. Payne, as well as Edison's assistants Charles B. Hanford and William H. Meadowcroft. The front cover is marked "War." The pages are unnumbered. Approximately 150 pages have been used.

[ITEM(S) FOUND IN BOOK]

IN REPLY ADDRESS
THE SECRETARY OF THE NAVY
AND REFER TO No.
O-Lu

NAVY DEPARTMENT
WASHINGTON

September 26,1918.

To: Commandants of Navy Yards.

This will introduce Mr. Thomas A. Edison of Orange, N.J., who desires to visit the navy yards in connection with his experiments. Please afford Mr. Edison such opportunities as he may desire in connection with experiments he has under consideration, and extend to him such other courtesies as may be consistent and practicable.

Josephus Daniels

Secretary of the Navy.

Sept 10 1918

Possible source of noises on Cargo boats

1 = Engines or shaft
2 Circulating Pumps
3 Boiler Pumps
4 Ventilating fans
5 Dynamos
6 Walking about
7 Water moving in boiler, bilge
8 Wireless
9 Propellers from boat under coaler
10 Cables or guys vibrating
11 Waves striking boat
12 Eddies made by screw
13 Bilge keel
14 Perforated Strainers
15 Bow waves
16 Vibration of pipes
17 Noises from the Ocean
18 Rudder shaft loose on sleeves
19 Intermittent stresses in main shaft
20 Vacuum Pumps

21 Water hammer in pipes.
22 Loose doors windows & pieces
23 Handling Coal

Musical notes of different pitches are audible for distances [illegible] inversely as the square root [illegible]

Speed of sound in pipes filled [illegible] water

Diam.	Thickness of shell	Metres per second
.720	.032	998
.468	025	1046
.338	020.8	1164
.600	080	1213
.400	080	1281

Continental Telegraph Charges.

C	—·—	Y	—·——
F	··—··	Z	——··
J	·———	1	·———
L	·—··	2	··———
O	———	3	···——
P	·——·	4	····—
Q	——·—	5	·····
R	·—··	6	—····
X	—··—	7	——···
		8	———··
		9	————·
		0	—————

Experiment on Magnesia paint for Camouflage

Penetration steel plate machine gun bullet

50 ft	.52	of inch
300	.40	"
600	.30	"
900	.21	
1200	.19	
1500	.10	
1800	.07	
2100	.04	
2400	.03	
2700	.02	
3000	00	

Hanley listening

New London Experiment Listening boat still
Sub running 385 ft min Counting Cocos.
3/4 up. Smooth water no boats in
sight. 5775 Yards limit
direct listening 2.88 Nautical
Miles – Sub 3.88 Knots hour Rev 138@140
When listening boat out in Ocean & rolling
Could only hear to 2438 yrds 1.215
Nautical miles, waves 2 @ 2½ ft white caps

Condensite Co –

Infusible Condensite
110 Denat Alcohol
100 Resin
15 6/4 – to harden use 5 Para

See if formaldehyde combines
with Paraphenylenediamine –
its a base

Run Varnish Experiment Req
formula leave out Sandrac
Use 5 7 10 15% Para
bake No 2 schedule
with best all round % flock
blank – also 6% Para + Op 11 + 15
6/4 –

Varnish with Req 6/4 &
Enough Paraphenylenediamine
Hydrochloride to Cause the
Acid to Combine with the
free Nitrogen gas

Also Expmts with Ammonia Lampblack to color)

Try expmnt of adding Diphenylamine Paraphenylenediamine + other reducing agts ref in Melted Resin to keep it from oxidizing

Expt to Trim Edges of record by grinding with Carborundum wheel + previously forming them dry + also by a Electrically heated Knife or wire or by a rapidly Revolving wheel kept very hot

In making blank use water jacketed plate + Removable top so moment blank is made to set on plate + top put on to cool it flat

ditto Multiple + Lettuce 140° Falls
try Rolling Band Lemke

Expt on Sawing cold gobs, hot gobs Shearing gobs.

Expt on an Auto Varnishing Machine.

Expt get rid of oxidation of gobs

Arrange cages to put new records for time tests, on shelves.

Run wear tests when get good record. Reg. also wear tests on high pers + also high b/p — + put these away for time tests,

War gases – Nickel Carbonyl
Hydrofluoric – Sulphuric Formic
Trichloracetic – Cacodyl + Cy of C

" ——— Dichlorethylsulphide

Gases used
Dichlorethylsulfide,
Chloropicrin
Phosgene,
Diphosgene
Bromobenzylcyanide
Diphenylchloroarsine,
Butylmercaptan
Stannic Chloride
Silicontetrachloride
Prussic Acid,
Ethyldichloroarsine,
Phenyldichloroarsine
Chloride of phenylcarbylamine
Bromomethylketone
Chloroformate of Dichloromethyl
Oleum 60% H_2SO_4 + HCl –

Mustardgas Allylic sulfocyanate
Roller feed 5" tin chimney
3/4 lb Chalk 15 seconds
good smoke –
China Clay

Another man says recommend
gases as Dichlorodiethylsulphide
Bromine
Chloroacetone
Chlorosulphonic acid.
Dimethylsulphate

Try electrifying the Chalk etc
+ pepes or stuff used
Stay up:

Mustard gas is intoxicated to a resin

Ethylenic Sulfocyanate
attacks Eyes strongly
Excites violent sneezing
is a solid + probably
not available

Silicic Ethers

Ethylsilicic Ethi – Tetra Silicate
Liquid S.G. 0.933
B.P. 166 burns with a
dazzling flame depositing
a white smoke of Silica
in an extremely fine state
of division – H_2O slowly
decomp. it to Silicic acid

Silica
Fairly cheap

Silicohydric Chloride
$3SiCl_2 . 4HCl$ made by
passing HCl gas over over
metallic Silicon heated to barely
visible redness.
Colorless very mobile liquid
S.P. 1.65 B.P. 42° C.
fumes strongly when exposed
to air smoke deposits white
film on surrounding objects
irritate suffocating odor,
highly inflammable burns
green fairly luminous flame
depositing Silica
Vapor mixed with O
Explodes violently by spark

Silicofluoric Acid
fumes in air

Silicuretted Hydrogen
Cheap – easily in an excess of
white chloride silicon

If gas is passed into air
Each bubble explodes fore
spontaneously with
Explosion giving dense smoke
rings

Succinic Chloride
Strongly fuming liquid
BP 190° C

Dichloroacetic acid
suffocating odor Very
Corrosive

Ethyl-Benzyl-1 Dichloride
Extremely pungent odor
BP 214

Monobromoacetic Bromide
Liquid BP 150. fumes strongly in
air, attacks mucous membranes of
nose & bronchial tubes & produces
deep wounds when placed on
skin. its vapor instantly
destroys cork stoppers

Chloroacetic Bromide
Lacrymatory fumes

Ethylene dibromide
Copious fumes of Fumes

Dichlorobenzyl sulfonic
in closed flasks acc of
heated it, will give
a smoke —

Benzyl sulphocyanide
Powerful odour

Methyl Isocyanide or
Methyl-Carbamine
Mobile ~~sol~~ liquid SG 0.755
BP 59 – Very powerful
odour. Vapors are acrid
& very delicious, almost
instantly producing Nausea
Vertigo headache & depression

phenyl Isocyanide –
not nearly as strong
but cheap to make

Ethyl Formate
Extremely irritating
Vapor BP 82. SP. 932

Amyl Nitrite

Ethylsulphocarbimide,
Tears Exciting, burning pain
when on skin BP 134
Vap D. 3.03 SG same as
water

Bromoacetylene takes
fire at ordinary Temp in
the air, if mixed with
Coal gas mainly indifferent
gas. Likely to explode
strongly heated in Contact
in Contact with the air
forming white vapors of
Bromacetic acid –

Acridine, Cheap from
Crude anthracene
MP 107 - when inhaled as
dust Causes sneezing &
Coughing -

Dibromo aldehyde
needles, Sol water, alcohol
+ Ether, pungent tear exciting
Cheap Easy

Monochloro aldehyde
Cheap. Easy
Crystals Clove oil
pungent gives vapor
attacks Mucous membrane
attacks skin not seen or
felt at first but in
time cuticle peels off

Benzyl isocyanate
Liquid - Excessively pungent
odour + its vapor causes
Eyes to smart painfully
BP 175 @ 250

Sulphocarbonyl Chloride
also
Perchloromethyl Mercaptan
pungent tear exciting.

Active principle of
Smart weed - qct sense

Trichloro crotonic acid
very caustic destroys
the skin - liquid

Crotonic Chloralhydrate
very sol alcohol
MP 74. vapor powerfully
attacks mucus membranes
Eyes
Chemically made from Chlor
into aldehyde

Methylene Acetochloride
pleasant smelling suffocating
odour liquid BP 120
591.19 cheap

Bromopropylic Ether
liquid BP 172
burns a green flame
fumes of Boric acid

Torpedo 50 ft sec
Cargo boat at 10 knots
16.66 ft sec
for every yard torpedoes
go cargo boat yards
(Especially 1 foot)

Arsenious Dichlorophenide or
Phenyl-dichloroarsenide
liquid fumes in air
Only chlorine small pd
Gas is very corrosive
action on the skin [illegible]

Arsenic Oxychlorophenide
$C_6H_5AsOCl_2$ solid but
fumes in air

Propyl Chlorocarbonate
BP 90@160-Mean 125
Pungent vapors strongly alkaline
Vapors made by mixing hydrogen gas

For secret wireless use so high a note Bell Repeater will not make it audible
use Cl alk lo Cofano

Moved a 3" sharpnell
Shell and my new Clock
[illegible] use large quantity
Wood fibre

See Rudy about 2 shoot[illegible]
[illegible] also double
tube, till at Garrage
Blandelion,

Carbonyl-thioethyl Chloride
$CO(SC_2H_5)Cl$
Tear exciting liquid

Titanium dichloride
Acid when touched
with a drop of water
Catches fire

In trying the 56 ft of tube
at Garrage. Try the cap
on end, also the cap + a
deep 6" dia to deflect
+ Concentrate to build
up to greater intensity

Try Taper 6" long leading
to Stethoscope,

Try Metallic sections
of tube using instead of
Rubber for Stethoscope

Fred. H. Cut out a cylinder
from the Chronicle
for Mark Cellophane —

phenylmonochloromethyl ether
Chloromethylether
MP 97 — Meyer pap 1341
Sublimes without decomp
Fuming in air when boiling
with water strongly irritating
Mucous membrane & eyes
Solution burns the skin
Violently. 3rd Sup under
acetone — p 5
Very [illegible]

Dibromacetic acid
Crystals not affected by
Vapor strongly irritating
Mucous membrane BP 232

Bromacetic acid
Crystals — dec H_2O. MP 130
Boils 250. water, when dry
may be touched with impunity
but if moist produces
violent inflammation of the
skin —

Mono bromacetone
liquid Very irritating smell

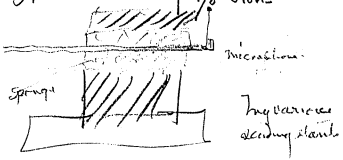
Acrolein

β-Bromacrylic acid. Solid
[illegible]
blisters the skin

Methyl — Ethyl Bromacrylate
Bromide, Vapor attacks
mucous membrane

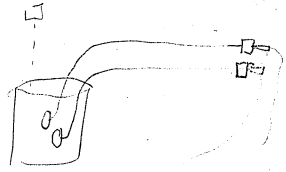
Chloroethylene
Only liquid
BP 217 - 1 attacks
Rubber strongly
acts as a nerve poison
3rd Sup p 452.

No 12 wire say 1/8 iron



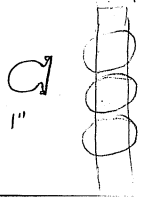
Vibrator at other end located by a key — lay on ground

1000 ft long - 4 ok
go to limit

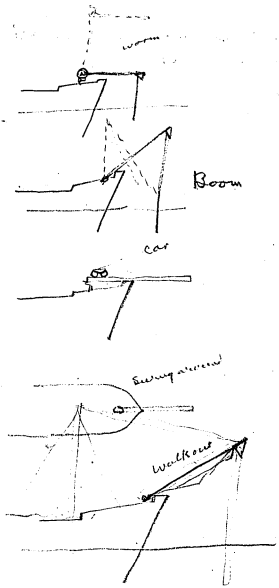


Water drop 2 tubes 2
dia 4 2 telegraphs -
Series & multiple with
audion -

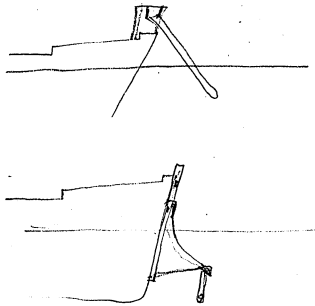
Get a good 4 o large
also



Make diaphragm 1"
4 6 of them



Connect listen rudder on a swivel so it's that way always —



Monochloroacetone solution
3 cells Bunsen test on mixture
HCl & Acetone - only liquid
BP 117 SG 1.14
Vapor acts strongly on nose &
eyes. produces copious flow of
tears — Vapor density 3.4

Dichloroacetone by preparing
Chloroform - only liquid
BP 116.5 SG 1.331.
Smells like chloroform at 1st
but after few seconds attacks
nose & eyes with violence
liquid blisters skin like
Cantharides making
wounds difficult to heal
Vapor density 3.2
insol water,

tetrachloroacetone only liquid
Very soluble pungent
liquid blisters skin
when exposed moist air
forms Crystals sol water
The chlorp ketones act like acetone

Bromoacetone produced
same way as Monochloro
attack Eyes so strongly
Spilling few drops renders
air of room unendurable

Chloride of Acetyl
BP 55° Vapor attacks
Eyes & respiratory organs
strongly – Decomp by
water violently yields
acetic & HCl – n.f.

Acrolein oxidizing Energy –
BP 52.4 Vap density 1.897
Lighter than water few drops
in room renders it now
unsupportable drop in
40 cts water, Cant be
kept long

Amyl Sulphide,
intolerable odour

Chloride of Arsenic
Oil – BP 132, V Evaps in air
at ordinary temp producing
white fumes, its highly
poisonous

Arsenic Fluoride
4 times heavier than
air, produces painful
wounds BP 63
fumes strongly in air
at ord temp

Arsenuretted Hydrogen Gas
dangerous, Element Killed

Can be made by dissolving
Zn, Sn or Fe in aqueous Arsenic
acid, Cover put in shell
+ close it + fire after pressure
has arisen to 500 lbs say
No danger to Makers.

or electrolysis Arsenic acid
to proper pressure

Being a gas not solid
water or bombing with
acids, a large number of
shells would make a
bad for certain areas

Liquefies at 30°
below 0 gives
Spec of 2.695
when largely diluted produces

Nausea, giddiness & oppression

Arsenuretted
Oil – BP 133° does not
fume in air nor dissolve by
water but dissolves freely in it
Vapor exerts a most violent
action on human membranes
on smelling it the eyes nose
eyelids fill up
speedily lacrimating
pains extending down to
the throat –

Blowing air over 60%
alcohol heated 8 minutes
good – nozzle 1/8 dia
smoke 6 ft long cone
outer end 3 ft dia

Fluoride of Boron – smoke

Fluoroboric acid Oil like H_2SO_4 – fumes in air – smoke highly Caustic. Cheap

Borate of Ethyl Cheap. Mobile liquid burns & gives off smoke. Vap Den 5.14

Biborate Ethyl Thick liquid gives off white fumes at 200°

Vapor of thionol one like formaldehyde in smell ~~[illegible]~~ + HCl. burning in wet tinder make smoke

Aniline detto

Vapors of SO_2 + aniline. also HCl + vapors of aniline

~~Cyanic Acid – [illegible]~~

Cyanate of Ethyl Liquid BP 82 Intensely Tear Exciting Vap D 3.04

detto Cyanate of Ethyl " " Methyl

highly valuable Tear Exciting Choking Vapor BP 90

Cyanate of phenyl

Cyanide of Ethyl Cheap Solid BP 82 Very poisonous Liquid

Bromide of Cyanogen
Melts +4°C Vap D 3.67
Volatilizes at 15.C
Vapor very pungent odor
Excites Copious flow of tears
1 gram dis in H_2O &
poured into wound Lungs
of Rabbit killed it
instantly

Chloride Cyanogen
gas. intolerable odor
Excites Copious flow tear
SG 2.524, at 4 atmos
Condenses to liquid
Absorbed dry 100 Volumes
of gas Extremely poisonous
a great Care must be
taken to prevent it
getting in the air where
people live

Dichlorocarbide of Ethylene
Liquid pungent like horse radish
raises blisters on the skin
Even the vapor destroys the
epidermis on more tender parts
Insoluble in water SG 1.4

Fluoride of Benzoyl.
very irritating vapors -
liquid, oil - BP 161.5

Formic acid - Ulcers

Sulphurous Acid + Aldehydes
blown to pieces make a
smoke.

Trichloromethyl chloroformate
Very poisonous, used by germans

Germans issue a Sneeze Bomb with the
melted TNT -

Make Silicates of Ba Sr Mg
Cu Zn Sn + Sb As Pb Mn
Fe Li Al for Chalks -

Stannic Chl fumes strongly
highly Caustic

Try Vapor Arsenic &
Sulphurous acid from
burning sulphur
distill Arsenic +
CO_2 from Chalk & acid
for smoke -

Try if Bromine Chloroform
Vapour gives smoke
with Ammonia
We got a lot from Tommy

Distill Naphthalin
in draught of air -
also other cheap solid
distilling at low temp

Dissolve Naphthalin in
the best Very Volatile
Solvent, not Explosive
the Solvent Evaps +
leaves Nap in air -

Distill Stearic acid
with hot air -

Consider Use in flame
when hot should
smoke -

Periscope from deck to oil burner leaker in hole to regulator no smoke

Stearic acid is good tried it. Very fine

Naphthalene smoke seems to disappear quick and not near as good as Stearic its fine

Resinate of Magnet in iron dish ~~[illegible]~~ red hot coal nearly. gave off smoke in considerable quantity for 15 min using nearly about ONE Gram this is remarkable - [illegible] White Blue black Cast from furnace

it kept burning almost to the end & apparently the MgO all went out -

2 grms poor Chloride Aluminum gives lots smoke in heated cup for 4 minutes - Very good smoke, practical

Stannic Chloride about 2 grams wet gave off a fair smoke for over 25 minutes - This seems for per gram the greatest smoke - $AlCl_3$ gives off 2 or 3 times more vol but only 4 minutes - Think if $SnCl_4$ were anhydrous it would give off much more as there was quite a residue - it seems [illegible] Cranmer heart of Oak Rod at Lecom -

Buy some of def Chloride of Antimony –

Pentachloride Sb treated with ammonia – a solid I found in Cans Makes a very white smoke + large quantity thereof but less than 2 grams. smoke is 2 to 3 times more than $SnCl_4$ 1 ft minutes getting then it burns only a little powder on bottom of dish 5 mlg –

Solid Chloride of ammonium White smoke good volume Vol equals $AlCl_3$ – about 2 gm or less, after 3 min poor Vol quickly thereafter all gone not good product for the money

Try Sulphate of ammonia also NaOH

Oxybromide of lead on heating to fusion gives off dense white fumes

Heating lead oxychloride gives fumes

Boric Methide gas. at 10°C under 3 atmos Condenses to liquid takes fire spontaneously when touches air – If if air tube to work dia the amount of smoke is surprisingly voluminous

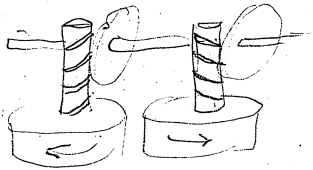
3 Cubic inches of gas fills a capacious room

Carbonyl Nickel Condenses with Nickel – this is a solid that completely volatilizes

The vapor is very inflammable
Not affected by Oxygen at
any temp - forms below 100 c

Dichloromethylchloride
a small quantity spread
out on a surface soon fills
the room with suffocating
vapors of Phosgene
+ sulphurous gas
Sulphur dioxide Watts Dic
p558-9

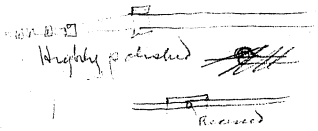
Try if Benzene sulphonic
heated in Cup gives
smoke



Payne

Stethoscope -
Pneumatic End or bell to
make it soft on ear + close
it

pneumatic, Rubber

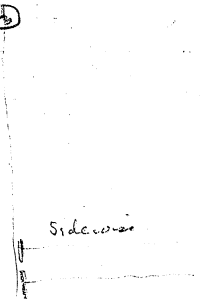


X Sect

Keeper together
dowel,

Lex pointing
to Earth, & also up

also



Close together & independent

Steam Chuck closed
by spring & by
Night pressure
See if Rubber ring in

Soak some (lump) of Mg Si in Alcohol + dry

Sound = Paper
Directly to their length
if dia is doubled loss is
1/2 if pressure of sound
waves is doubled the
loss is doubled

Diphenyloxamide
Crystals melts at 320 +
gives off unreducent fumes
by sublimation under
Oxamide - Reg Watts 286
Insol H_2O

Benzoic acid sublimes
insol Water
Ditto Salicylic acid

Try I gram of all the
Organics in Case for smoke

Silicic Ethers

Ethylsilicate Ether, Liquid
BP 165.166 - its combustible
burns with dazzling
flame depositing a white
Quite infusible in a state
of Extreme minute division
insol in Water
Ether is the Tetraethylic Silicate

Iso-Sulph acetone
BP 183 @ 185
VD 5.08 - Vapour attacks
eyes strongly, burning
sensation Inhalation

(5)

Monochloallyl sulphocyanide
pungent smell like mustard
gas

Mercury compounds of Allyl
these irritate the skin
but not perceptible for several
hours then painful
blisters appear

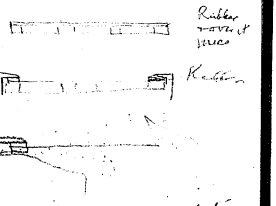
Chloropicrin
(Trichloronitromethane)

It has a more violent action
on the respiratory mucous membrane
than either Chlorine or Bromine
fumes. Causing suffocation
vomiting & tears.
Cheap. action Ca hypochlorite
dry & picric acid.
or by decomposition
of chloroform 3rd Eng
328

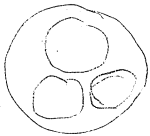
Find best solid solvent for
Wax gases & vapor that they
absorb all the gas instead
of charcoal

Try an experiment say of
passing alcohol vapor
1/8" bumps of Rosin in
long tube & see if any gas
stuck.

Kayes



+ Rubber 1 inch side no plate
.005 T .002 mica



use this then

Logging of gasoline tanks
Carburetors are intake –
Chinese food warmed loggy
also for above fact of
Aviators

Make lot of Mg hydroxide Chalk
also CuO see if he uses
precipitated CuO if not try some
Silicate Mg.
Then try all the different
pens, especially the small
ones. When get best try
all kinds diaphragms
built up etc. – Then KOH, LiOH,
NaOH, in different concentrations.

Try 2 Chalk & Chromes in
Optics,
~~Then Microfine Tetrazen~~

Best chalks – make at high pressure
soak & wet smooth before burning –

Strontia Carbonate	30
" Oxalate	38
Calcium Oxalate	32
" Silicate	34 @ 36
Black Stannous Ox.	28 @ 30
Copper oxide	32
Magnesium Fluoride	24
" Hydroxy –	24

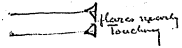
Britton Secy of Daniels –

Look up the one that was weak on Zero & not much weaker at 20, this has high Res & under pollendum Condr to be used & it might be very sensitive as Could double the frequency

Built up diaphrm built up
Must be made so pull of
Lower Compressers sections
get some Condensers & Quad Res
boxes – when new books made

Weather – Quite Calm very little wind
Sept 23 1919.
1/2" moth tubes brass 50 ft long set on
rubber sponges – Cup on end but no Dia

Really 7/16



with Stethoscope old style 1 tube hear
to 330 ft, other Tube 330. both act
alike –

With Listening tubes seperate & using
both tubes simultaneously hear to
470 ft

Then with stethoscope old style
Connected to a single tube by a
Tapering tube

heard to 375

with two tapers & two seperate listening
tubes & 2 brass tubes

heard to 500 ft

With the sound boxes seperated
3" can hear to 485 ft a loss of 15 ft
Seperated 6" hear to 475 ft " 75 ft
" 12 " 375 " 125
" 24 " 340 " 160

O Sub

arranged at right angles to source of
Sound hear to 275 ft.

arranged lines hear to 260 ft
if twined towards ground hear to 250 ft
twined to sky hear to 250 ft
Sub

X placed plate 1 ft sqr 1/4"
thick 2 inches away in front of
tube boxes hear to 260 ft
when holes bored in plate so boxes
flush with plate hear to 500 ft

Listened to sub through air hear
to 550 ft.

We now tried diaphrams in boxes on
tubes using old Gothscopes single
tube, Mica .001 heard 300 ft

1/2" tube	0015	300
	002	300
7/16 tube	003	280
	004	260
	005	235
	006	210
	009	190

Listened thru 2 tubes with
.002 Mica in each hear
to 500 ft.

We now try single tube 3/4 inch inside dia, the 1/2" tube was outside dia giving only 7/16 inside dia.

50 ft. using taper heading from 7/16 tube on bound box to 3/4 tube + also taper to a bell

Stethoscope

Hear to 515 ft with single 3/4 tube as against 330 ft with 7/16 tube

With 2 3/4" tubes hear to 600 ft not quite so quiet as yesterday

Experiments 7/16 1/2 tubing 7 lengths each 14 ft long - Taper at listening end + rubber stethoscope tubes, Rag Cup - Quiet day (very) no wind.

98 ft hear	258 ft	general loss of 1.4 ft per 7/16 tube
84 "	273	
70	288	
56	298	
42	325	
28	350	
14	400	

See next page

Wanted for other experiments

loss of a bout 4 yards at sea per foot of 7/16" tubing -

14 ft.	sqr of 400 ft	160 M
28	" 350	1.31
42	" 325	1.52
56	" 298	1.79
70	" 288	1.92
84	" 273	2.16
98	" 258	2.42

At new London, dead calm heard Sub 5775 yards 3.28 land miles -

Rolling boat rough water, 2 ft + white Cap heard 2438 yards 1.38 land miles 5.6 Tower London

As the deck must be at an angle of 18° to fire a Torpedo, no matter what distance from a 10 Knot Boat, then the present diaphm being parallel to direction of Cargo Boat its efficiency will never exceed or fall below 80%
If Diaphm could be at the angle of 18% then efficiency would be 100%

Use ~~about~~ from infusion + paint surface with Strontium Oxalic yellow while burning to see if a track remains by the Sr Oxal will be as good as if all made of Sr Ox

test all the pens,

XX

Also tried 2 soft lengths of 3/4" hose without the 1/2" extension to get second 6 ox hose out around 60x to 3/4 - got 630 ft instead of 600 - perhaps some of this due to very quiet day at same time to check, tried 50 ft 1/2 paper wing taper at 2 lethers ofay got 275 ft - this had no sound 6 ox on (should have got 330, perhaps some) 6 ox ~~does not~~

Take 1 gram Condensite Carbon heat to 350° fahr ~~then~~ weigh hot then while hot expose it to Ammonia Vapor till Cold then weigh — no smoke

Hayes

Reg Taper

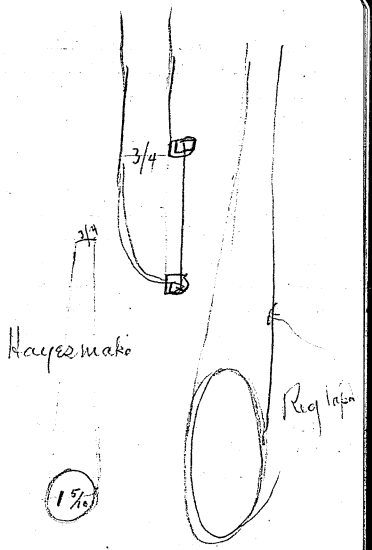
Make this of other simple taper works

Burns have another Sub made exactly alike the one we have with light lever for 300 ft with 3/4 tubes (2) & 3/4" Sound box opening & Experiment 60 drops min & 140 drops to find out degree of disturbance under all Conditions & how it affects distance one can hear faster Sub -

Experiment with one Sub going away off & approach steel ft that it is unmistakably detected

Don't forget this point

Important.



Hayes when you made test of putting sound boxes 3 6 12 & 24" apart did you put the whole length of tube 24" apart or how (angled them)

The explanation why men in sub running under with motor could hear the intermittency of sound of main shaft is due to powerful Echoes which serves to make sound Continuous & a very low hum although very powerful to those at a distance.

Ask Hayes if he took any of the phonograph records running out merely of horn regardless to sound of sound, Most all of them. had to put horn very close

See what liquid is best for etching glass use for smoke shell for etching glass of Periscopes

Electrolytic oxygen by Kott & Nickel plates to supply what is lost by rarefied atmosphere requires at Demand of

1 mile high	·3
2 "	·46
3	·63
4	·775
5	·9

Lutining Chemicals
Dibromethylbrassa
Quinone 2. 3
Para Dinitrobenzol
Diphenol (y)
Hydroquinone
Phthalic Acid 2
Meta Iso Phthalic acid
Isonicotinic acid
Meta aldehyde
Aligerine
Quinoline 5 also 6
Oxalic acid
Pentabromobenzol
Amarion
Amino-Anthraquinone
Ortho Benzoic acid
" Amino phenol
Azo naphthalene (aa)
Ortho Azophenol
Borneol
Ortho-Bromobenzoic acid
Carbanilid

Carbostyril
Cuminic acid
Cyanogen Sulphide

Bromide of Ammonia
Carbamate "
Thiocarbonate "
Arsenious Oxide
Chromic Chloride H_2O-6
Cobaltic + ous Chloride
Selenide of Hg
Mercurous Chloride
Molybdenum Oxychloride
Nickel Chloride

Phthalimide, Pyrocoll,
Quinone, Saccharin
Salicylic, Tartronic acid
Terephthalic acid (P)
Trioxymethylene (a)

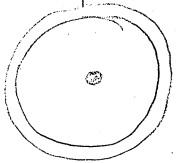
E P Kohler Amer University
Experiment Station Washington
Says they have tried Glenn
Ohell says we can test
them there.

Reason we hear only the
screw on boats thru water
is blades of propeller undergo
unequal stresses at each
revolution, + blades vibrate
like a bell 1000 sec 3 log. they
3000-etc, this is not heard
under water on account
of echoes — The general
vibrations of a ship which
felt by fingers etc would
slowly affect ear especially
as they are non periodic

Subs even at 4 knots must
have much higher pitch to waves
of blades vibrating as they are
only 2 ft whereas a Cargo
boat are 6 to 8 ft + also
because sub ~~goes~~ revolves
twice as fast at 4 knots as
a Cargo boat does at
10 knots

If the propeller blades give
the sound then each blade
must give periodic vibrations
if this is true an accurately
tuned resonator will
enormously magnify the
sound, as there are 6 blades
there will probably be 6
different periods with variable
volumes giving a noise characteristic
to Navy yard + test
the vibrating times of propellers
on land also at yards where
they store screw propellers
for Cargo boats —

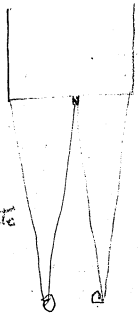
Water diaphm



Supported in Center
Then drawn 10/16 suspension

Make tube

+ see if just as good as seperate tubes

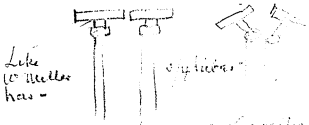


on seperate stethoscope tubes see of lagging to prevent loss of heat increases distance hear sub -

Its probable friction of sound waves in pipe per ft is independent of the surface, & directly as to the pressures on walls, the pressures in a 1/8 & 1" tube is same the surface of 1/2 is twice as great the loss of Vol in small tube over large one is less of heat the loss with strong sound is very much more in % than with weak ones - call Hickory

Make test blindfolded at Tannage to locate sub by biaural sense Jenny, Hayes, Simpson Pierce see how close

Make two like this



Want to see about direction -

According to squares old stethoscope ~~of~~ taper with old stetho, the taper makes it 40% more sensitive

Try drilling holes in a plate see what happens

use expanding Camera shutter

Try direction expts with single tube & find sub in fixed also 2 tubes & check by Ear -

Knowns, Making taper ~~to~~ more or less per ft is not correct should be same condensation per ft. for instance 1/8 larger dia per ft starting at 1/8.

1st ft		1 to 4
2nd ft - by itself -		1 to 2½
3	"	1 to 1.77
4	"	1 to 1.56
5	"	to to 1.44

in other words first ft has too high a condensation

It looks as if stetho having 36 to 1 condensation in 1 ft too severe that 3 or 4 ft fixed taper, 4:1 ft stetho nearer with 1 to 4 condensation would be better

the cohale having proper varible taper

[25]

Burns to make a Taper 3/4 to
1 5/16 but twice as long
Another 3 times.

Test the little adjustable
Resonators out in field direct
by the Ear + on tubes —
Sub + Music Box

A double Cup separate Stethoscope
for Doctors would be good —
Get Bostone or then make
a double and test
Biaurial Stethoscope

See how Deans progressing

Meadcroft to ask Newark Yard
if shaft is in boat before launching
+ where is Screw propeller put
in —

Ask Payne if Hydrogen Det
is still in Sub when he left,
+ if they received Chlorine masks

If Chalk Phone is twice as
loud as Bell phone then
if efficiency of Bell is
10% — the Receiver will be
1% If Chalk is 20%
then Receiver will be 4%
or 4 times better

good musical sound
from blades of
Newark Cargo boat
Gd Red 1 shaft —
Geared turbines
10 1/4 — 4 blades

Hexanitrodiphenylamine 51%
Diphenylchloroarsine 48.2

This Explosion gives a very irritating black smoke

New London, letter from Secy of Naval Experiment Station "J M Defrees"

In all cases Cargo boats make more noise than Submarines

Under ordinary conditions of Weather Mechanical listeners which detect a sub at 4 knots submerged at 2000 yards will detect a cargo boat at 12000 yards when running 10 knots

with the electric which will detect a sub at 4 knots at 10000 yards will detect a cargo boat 40000 yards - no other vessels in the vicinity to interfere Ranges will vary with different types of ships & observers

Above are averages of many observations

Cargo B 36 times greater Volume mechanical
" Electrical 16 times greater Vol
Cargo B -
Electric 25 times more sensitive than Mechanical -

In listening for noises
in tubes with phones use
a break which shorts the
listening phones say 10 times
sec —
With tubes have a
revolving shutter at intake and
3 per sec to make a
continuous noise audible.

Hayes try

open on end bored to 3/4

4 3/4 tubes —

88

[illegible] [illegible]

also - 3 6 12 24

other ear

1 ear

Note 1/2 the dia twice the number of
reflections per inch of length
at 45° deg. Jed says same ratio
for all angles

Hayes when listening on
Dachem - follow in wake
of boat & see how far can hear
think which will go 2 or
3 miles - also ahead & parallel -

If we hear a cargo boat
750 yards, and a Cargo boat
makes 36 times the noise, according
to N London We can only hear
a Sub 125 yards -
as Hanley heard a sub 5775
yards taking in squares their
device must be 214 times
more sensitive than ours

Hayes - Try Resonators on tube
Edham listen to Sub with Resonators

CB13

Edison out of doors at Garrage
test new single ear stethoscopes
Each connected to a 14 ft 3/4
Tube + Stetho alone for
duration.

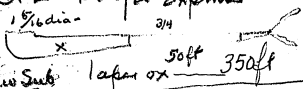
Make taper tubes 1/8 at small end
1" at large in, this makes reduction
1 of 1 ft " 1 to 64 pitch
1 of 2 1 in 32 "
1 " 3 1 in 21
1 " 4 1 in 16
1 of 5 1 in 12.8
1 " 6 1 in 10.64
test with Sub + Illinois 6 ox —
Listening hard rubber for ear
should be put directly on
the End of each tube

Make up the 1/4" Elmwood Twins
tubes bunched with 1" dia as
near as possible + make a
taper same as stetho.

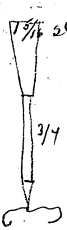
Wood End

⊗ Sub ⟨ with 7/16 hearts ⟨ 210 ft
50 ft

Oct. 2 Hayes Experiments



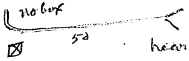
New Sub taper ox — 50 ft 350 ft



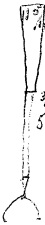
new sub.

Hearts to 370

210 ft
new sub



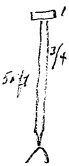
heard to 210 ft



Music box

heard music box
270 ft

Duplicated with Reg Cup
& 7/16 tubes
heard 100 ft.

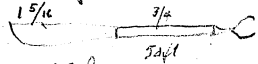


heard music box 260 ft

tubes with 1 9/16 box 245 ft

These 2 Experiments
bz tried again wind
came up

We now try old Rechmann

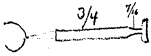
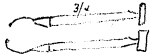
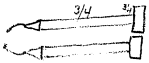


heard to 650 ft

heard to 650 ft.

Doubtless mean double tubes

It looks as if the sensitiveness depended on the pressure in the pipe at Constant Velocity of sound independent of the surface -
The 2 ears nearly double.
with 2 tubes both same size & at Constant pressure -

	Feet	Square
	330	109000
	470	221000
	375	140000
	500	250000
	515	265000
	600	360000
	630	397000
	650	425000

Hanley When you were listening to Qub at Nahant did you have to Constantly Keep turning the boat and did you spend a good deal on weakening Either ends + keeping to strongest place + could you Count Rest all the time or did you Count at 1st & then wait to strong place by turning boat what was avg of boat-weather 2 hauls or 2 things to Regulate.

Next heat boat to run ahead or drop behind till lost + stop everything see if pick it up again + how long a time.

Try angles -

Hurry up double listening tubes also double tubes on each side -

Hayes in 3/4 2 tubes 3/4 opening
in Sound Boxes, use 002 mica
with 3 hole plate, then 3 hole plate
and 002 mica, also

sep 001 dia,

I guess 3 better than 4 -

4 or 5 separate
002 diaphr
in Sound Box

to go on end of 3/4 tube

Fred Att - Make double length
stetho. with 1/4 opening + to fit
Ear if possible -

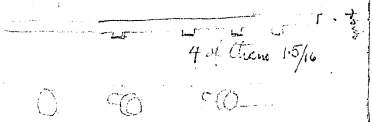
Hayes try with Resonator

I may want Resonators up
to 20" 12 to 20 - 8 to 12 - 5 to 8

find out from Capt Harris
if Can anchors or tie boat
to dock + stout screw 18 Knots

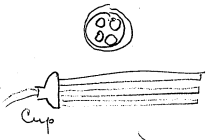
Hayes. ~~to have Experimenter~~
~~Listen direct then turn~~
~~with 1 ear then both~~
~~to check Exp's~~

Arrays make



On Audion, try 2 Receivers in Multiple & also series with seperate Listening Tubes to take advantage of both Ears Seperate them as far as possible & try get them same sensitiveness

Arrays



Arranged as 1 or 4 3/4 Tubes be used - seperate plate -

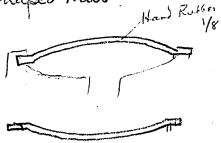
Returns make the 3/4 x 1 5/16 aft as long keeping same dimensions, at Ends —

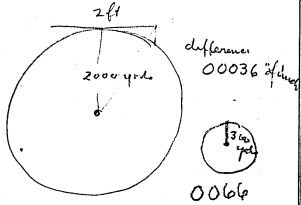
for Enlarged funnel like end to 3/4 inches thick starting at 3/4 – Each foot should be 1/16 more in dia + to double pressure should be 4 ft long 1 1/16 at mouth to double distance

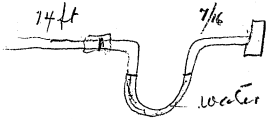
9 ft long mouth 1 9/16

Same relation at widening End. might not do as it would be 10 ft – Try 2 ft + 4 ft 1st – 3/4 to 3/16

Hayes in bbl of water try thicker diaphrms clamped tight no plate try hard rubber 1/8 / 1/4 thick also shaped thus



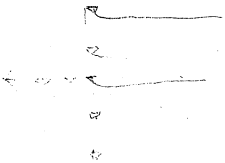


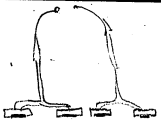


See what it does

*sub

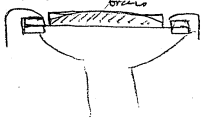
Try different





weight to back
pressure cannot
work him as well

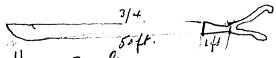
Cant move more but Water
Can — Thus Experiment to be
tried in Water



Try tips on 1"

Oct 4 some wind

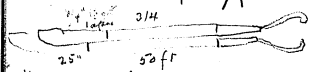
NEW Submarine



Hear 270 ft.
ear direct 345 ft

Oct 2
hear to 350 ft

A

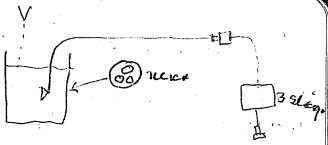


Hear 400 ft. - E new listening Tubes 400 ft
Ear direct 345 ft.

hear 350 ft
Ear direct 345 ft

Using old Sub and A Expt
hear 525 ft
direct by Ear 425 ft

Worse yet



Single phone listening. hear to 40
2 bells in series single tubes to
Each ear heard to 54
then put 2 bell phones in
Multiple listening with tubes
to each ear heard to 60
Listening then to two regular
head phones got 148

Smoke full 8" stack.
200 cc Aniline oil. 54 Enclosed
10 lbs salt, lasted 80 minutes
full — for 10 ft stack
Requires 75 lbs Aniline for
hour, Costing $252 for 12 hours
this Covers say 225 miles
in the 24 hours — This is
much more smoke than EVER got from
Lunenberg!

should say 2 sticks
beside the 10 ft stick of
3 ft in dia wood
Commencing the smoke
or 5 times less (10)
$5 daily

Rubbers like hard Rubber
worked by
Celluloid, Compressed Camphor
White discord way
Paraffine -
~~Stones~~ Japan way
Ivory
Zinc - Glue with formation
Limestone burned -
Cork, glass, Steel
Rosin Sealing wax
Sulphur.
Gypsum - ~~Stone~~ Fluorspar
Iceland Spar!
Hard Rubber or Dense Shape

Condensers

In chalk phone put in 5 micro
farad to keep the Chalk from
giving a Current or diminishing
Resistance - also when
using Microfone -

Try with 5 mf Condenser
& Micro of adding
many more cells
microfone resistance
try 26 small carbon
Cells -

Magnesium Para Rubber ½ inch
Cell Mica 202 series filled with
liquid very light & also heavy
Try 2 1/2 Cup & 1/4" disc
also 1/8 supported in
Center so no flexing on a
3/4" tube & pencing
High Carbon Steel glass hard. longer
not drawn - ground
See further on
Tin - flexible
Metal

22.5°
5 Reflections per foot of tube

45° 12 Reflections

1"

1/2" pipe twice the number of reflection

Leg at 45° is 1 ft in 2 1/2 of pipe

Side reflection

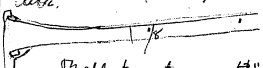
Hayes, Make full size 1 5/16 Cups, with Hard Rubber 1/8 thick 4 of them,

pressure will not except with Lucas & there will be concentration

Bottom Dia Condensers →
Gilsonite, Cannerone,
Candelerna wax / Lead
~~Zeo~~ Bone Horn
Phenol Resin - Pitch
Asphalt. Compressed Naphthalene

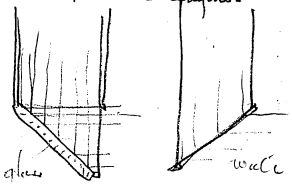
Phosgene Gas Condensers
with Anilene becomes
acid, forming Carbonanilide
& Anilen & Hydrochloride

After trial of the 1/16 capes 20 ft tubes.



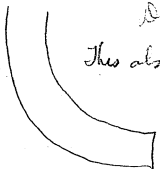
Bell it out over 4" length as wide as possible so it just fits 2 ds =

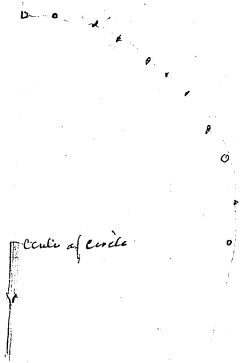
~~probably tube should end at 1/4"~~
~~This removes 2 lengths.~~



Dia -

This also





With the multiple 1/4" tubes + also Reg single tubes 3/4" test relative direction,

If it shows up good under a lot of 1/8" + 1/16 tubes

1/16 taper

ft	square 1/16th	Pressure
1	441	
2	400	
3	361	
4	321	
5	289	
6	256	
7	225	2.0
8	196	2.2
9	169	2.6
10	144	3.0
11	121	3.6
12	100	4.4
13	81	5.8
14	64	7.0
15	49	9.0
16	36	12.2
17	25	17.7
18	16	27.5
19	9	49.0
20	4	110.0

1 5/16 big end

Later at small end 1/8 big end 1/32 small end
Later at big end 1/8 - 3/32 then 1/16 at first.
Later at small end 6 oz
Perhaps
1/8

Think last 2 ft showed 6 oz of glass as friction is so great

If 21/16 dia big end, 2/16 small
110 times pressure 20 ft long
then double length gives
42/16 big End — 4/16 at small
+ 100 times pressure,

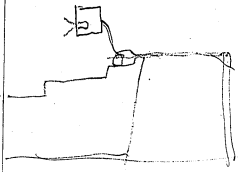
It may be Bullow that one wet with the water will be more sensitive than those like Hard rubber that are not wettable Try this out Those not wettable will have air cushion which is bad Must look out no grease from fingers -

8" Chimney 1/4 full
got 1 hour 4 min
1660 gms Nap burning
+ air passed thru
at 100 cent heat,
This smoke volatile
+ probably permanent
in air —

Make some resonators
Large in diam say 6"
to get the sounds from
propellor or any sharp
noise to echo say 12
times to give a musical
note —

also set of resonators for
Cargo boat propeller

Collect all my Helmolz
Resonators



It may be the sound
should be fed into
a Barrel + then with
Resonator pick out the
sound. The echoes
prolong + absorb all
the Energy

Possible means of detecting German 2 Knot noiseless Subs -

1 = Sound direct from knocking of shaft & propellers in boxes -

2 = Resonators to amplify the musical notes given by the propeller blades

3 - Bow waves (ie) displacement spreading out

4 Detecting eddies due to propellers -

5 = Detecting waves thrown out air by pressing of keels -

6 Echoes from very powerful Transmitter & tuned sharply Resonators for the note sent

7 = Echoes by the Pipe's Com

8 There are probably strong low rate waves & also Continuous waves not note heard because continuous Combs made audible by -

see next page

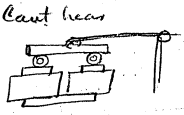
The music box glass cover gives waves of very large amplitude. Use Microfoons on tube & rotating plant ceement when on listening phone a see of Compact Heap waves

Tell Papa put gyro in Vacuo — ~~stop~~ drift —

Make a hard Carbon Microfon for jaws — use scutling dia & Moores 1st phone with hard Carbon & delicately balanced to be used with Resonators

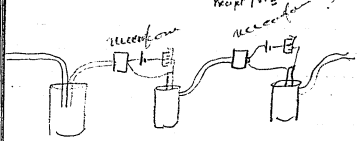
Get a Bell put in under water & listen to it, see if it is sensitive to extremely weak knocks just get slightly knock that can hear in air & then with same blow under water see if just as sensitive

Make a vibrating squeezer for squeezing 2 tubes (10) listening tubes together, using softest rubber, + ~~smoothing~~ magnet for pinching — + break wheel way off so Cant hear



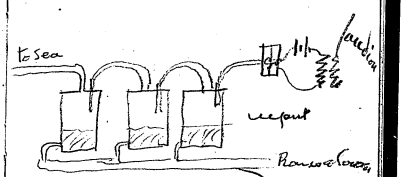
~~If Resonator output between each stage of an amplifier, then of strength of sub to 1st would give 2nd stage — 3rd " 4 " — noise only twice that of sub sub two + half times louder than sub 12 " " " 62 " " "~~

Either Mercury or Bell along
Recept 1000



so on then amply by
Audion —
The number of stages are
such that the noise is wiped
out by losses in transforming
while Resonators compensate as
far as possible for loss of
transfusion =

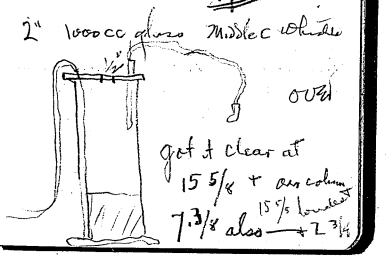
Experiments show that Open
tube resonator must be 1/2
length of Closed tube resonator
Middle C 5 7/8 open 11 3/8
Closed tube is 1/4 of wave length + [illegible]
Closed seems much weaker
but it had poor opening —
Listening tube 1/2 wave of Column of air 6 ft.



also at Receiver end
loss of resonance 25% Each
resonator, loss music 5 @ 10%
Using magnet punch Tube
Vibrator —

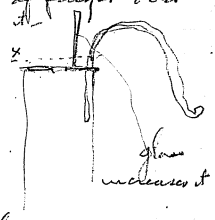
Expt

2" 1000 cc glass Middle C whistle



got it clear at
15 5/8 + air column
15% louder
7 3/8 also → 2 3/4

If I put a hole over hole kills at 1/2 of finger over hole kills at

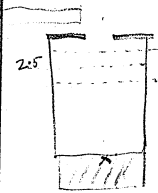


X holding glass at X don't diminish it much when 1/4 away

Air weighs about 20 milligrams per inch 50 inches to 1 gram

Have Hanford, Meadcroft put paper in every reference to Sound in Silliman & Phil Mag

with 2" pipe 5/8 hole in center get it around 15 5/8 – 7 3/8 2 3/4 – also by closing the hole more or less – hole full open in open air & whistle 256. blown more gently by gasometer get it 2 1/4 then at various points up to 1/4 inch & fairly loud. Think the Echo ~~the~~ that surfaces – strange



Node of fundamental is at x water.

Ratios are 1 fund then 3rd 5 7th 9th & so on

Antinodes are between these nodes.

Wave length of the successive tones are $1 - \frac{1}{3}\ \frac{1}{5}\ \frac{1}{7}$ etc

& vib frequency are 1 3 5 7 etc

No change takes place or little if a solid partition at an node is inserted — or by putting an antinode in free communication with the air —

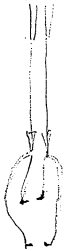
The greatest pressure is at the nodes — greatest amplitude at antinodes

The nodes — diaphragm have for manometric flames

fund	2nd	longer 3rd	bout	4th	7th	fund Wh	vib sec
16	5.33	3.20		2.285		64	203
15	5.00	3.00		2.142		60	216
14	4.66	2.80		2.000		56	232
13	4.33	2.60		1.852		52	250
12	4.00	2.40		1.712		48	271
11	3.66	2.20		1.571		44	295
10	3.33	2.00		1.428		40	325
9	3.00	1.80		1.285		36	361
8	2.66	1.60		1.142		32	406
7	2.33	1.40		1.000		28	464
6	2.00	1.20		0.857		24	542
5	1.66	1.00		0.714		20	650
4	1.33	0.80		0.571		16	812
3	1.00	0.60		0.428		12	1083
2	0.66	0.40		0.285		8	1650

Better get a bellows, from a forge or a hand pump & reservoir —

Have Hayes test this



leave one set open while listening to the other, then punch one pair out,

Open pipes have 1st overtone 2 next 3 4 + 5 which is different from Closed pipe which is 1 - 3 5 7 Etc.

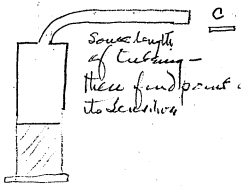
Stopped pipe is active lower than Open pipe.

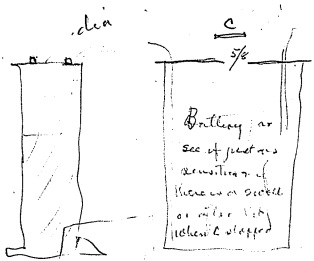
A condensation is reflected as a rarefaction and rarefaction is reflected as a condensation

34" pipe mid C

length 14 ft

With 64 Vibs sec the harmonics are
64 128 192 256 320 384 448
512 576 640 704 768 832
896 960 Etc
lower of scale C





also

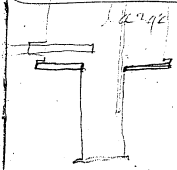
Tetrachloride Carbon warmed for air in tube, SO_2 64, NH_4 18, HCl 36

CO_2 44

Ticking of a watch of heard
300 centimeters in air centimeters
400 " in alcohol
500 " in oil
or 700 " " water

according to this water is 2.33 times greater medium

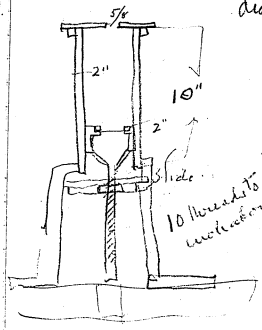
Centimeter .393 of an inch
2.54 Centimeters 1 inch



Try this

C1215

[illegible] tubes – to adjust:

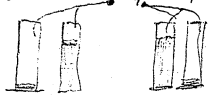


dia .002 Mica
1 5/16 Reg

Adjust for 1st overtone of C
& then run a curve with glass to
see how it varies changing glass &
then trimming. also keep 1st &
overtone sounding 1" below sounding 4 [illegible] glass
very slightly + see if this tuck
can be made up + the tone brought
back

Possibly might have to move
listening tube. If this scheme
works it will be a fine way to
adjust.

29th Experiment today 2 Resonators
were cc jars to each each 1 jar
$15\frac{1}{2}$" the other $2\frac{1}{4}$ @ 2 7/8 –



All listening tubes same length.
hear down at C note 550 ~ 5
+ with the 775 + still well
audible –

Cuts iron noise enormously —
a Ford on road clapped underneath
25 ft of listener but Engine going
at high speed did not prevent
hearing C at 775 ft.
then poffy came from head

My old navy book says high
sung of Submarine (commutator)
Can be heard for 15 miles in
Extreme Cases & another man
says 4 miles.

US Submarines

Boats G4 125 to 560 Rev
K boats 146 To 374 - G boats
1-2-3- 152@400 Rev min -
E1 150@340 min

Have 2 shafts Motor on each
shaft direct - impractice
that vary 3% on number
of Rev -
Loudest sound heard
needed is propeller &
gyroscopic Compass

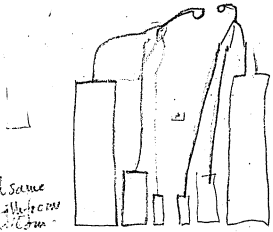
Commutator Segments or bars
G4 = 124 - 2 Commutator bars on
motor, Dia 17½"

G 1-2-3 288 bars Dia
27½" K 1-2-3-4-5-6 252 - 262 Vbs
bars Dia 24" see at 2 Kw
Number of poles G4 - 6
G 1-2-3 - 8 (poles) main
K 1 2 5 6 - 6 main poles

there is a perceptible humming noise when running submarine from gyroscope Compass

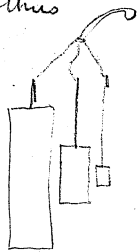
Table		Limit		Extreme Limit	
24"	8"	4.8	3.43	2.66	2.18
12	4	2.4	1.72	1.33	1.09
6	2	1.2	.86	.66	.54
3.	1	.6	.43	.33	.27
3"	1"	.6	.43	.33	Decimal

Magnetic this or magnet.



All same length from decom

on this



Oct 30 – 2 $2\frac{1}{4}$ 7th m
Multiple Loudes Chan one
4 m Multiple a little
Louder get it
Nnmolchiffle 31
inches from C
Long 1 hundredth 41 7th to 5 inch Bar
Today we get it 1090 ft
about limit Day quiet sono

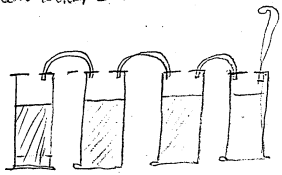
wind — found on reaction that these 4 are not nearly as reactive as 4 my multiple all turned $2\frac{1}{4}$ $2\frac{1}{8}$ — get it 31" from C =

It is very important that the resonators build up slowly for then the high notes of white caps & splash of water on boat & ripples will be so slight as compared to continuous high notes of blades of the submarine propeller —

Try also Open top Resonator also try a rim around it

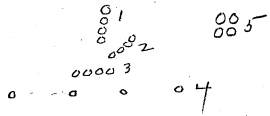
also a board as open separate jars more than $13\frac{1}{2}$ say 16 inches

to see if they interfere with each other —



See if this works in series to build up

See if it makes difference as jars are in these positions

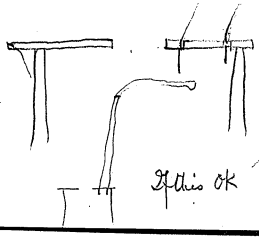


Also raise 2 18" high
+ leave others at present level

Get a good table to operate
on + level it —

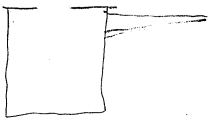
Put tent up 1600 ft.
+ then when get past 30".
go + test it — if OK move tent till
it reaches a limit

Test a single tube with a
funnel shape tube

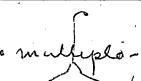


If this OK

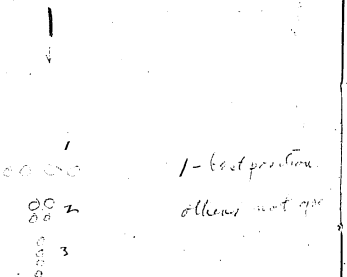
We can make it on small
jars



4 Res multiple -



got to 35" with Brass
Y/s - 31st Oct -
When Tank is full up
4 for 5 or 6 inches going
down heard to 44 inches



With glass tube up 14"
heard with single tube 34
This is disappointing
Apparently no gain by
putting up the Multiple
as far as Volume is concerned

With big $5\frac{1}{4}$ dia Res. $13\frac{1}{4}$"
in Tone with C 256 fundamental
$21\frac{1}{4}$ inches away -
looked on table Max distance
heard 28 inches -
with 2" glass tube turned
to $15\frac{1}{2}$ got it $32\frac{1}{2}$ inches.

The $5\frac{1}{4}$ tube Res has a 5/8
hole, I am now making it
2 inches & will adjust by
a glass plate over hole

2" glass tube Open on top
air Column 5 3/4
Can hear to 33 3/4 inches

Open 2" glass holding a 7th
tube) Rec near d end change
Volumin, holding glass
plate 3 or more inches above
hole no change only noise
when 2" holding underneath
of plate no change
Best place for end of brass
pipe (open end) listening tube
is 1/2 way down, which
is not the same for 5/8
hole closed tube 2" which
is just at top 1/8 below top
brass plate

Note Noticed enormous
loss of Volume of rubber

End of listening tube
dont fit Ears tight
Volume Change 2 to 3 times
less if there is an opening
must incorporate this.

The all brass 2" with
long screw & index.
with Diaphm & Chamber for a
bottom 002 mica to use a
plain resonator closed open
top — 5 3/4" air column
nearly on
resulting in the 5th plane
water column — Neither hearing
it has a diaphm of only
002 mica for a bottom
I listened by placing
brass tube listener into
top of tube — when I
listened to diaphragm
heard to 41 1/2

5 3/4 is best place hear by
Diaphgm — 40 1/2
Hear by using listening tube
at top — 37 3/4 —
so there is very little
difference, + if any in
favor of the diaphgm
Can't find the 4th —

As I cant find the 4th on
dead open tube I guess I
will be necessary to use
the 5/8 closed top —
will have to make a
2" 18" tube with
close thin bottom
and — with the 8"
2" brass tube I have
can get a 4th —

after cutting 2" hole instead of present 5/8 in
top of 5 1/4 dia big brass
tube we found proper column
of C fundamental is 14 1/2"
listening from top —
Greatest distance C can
hear is 52 1/4 mch

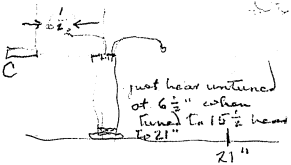
High water mark,

Tuesday when he slips +
stands over to C which the
sound not heard naturally
but takes time to build
up + after shutting off it
fails off + This is not
absolutely certain but
appears so

Have Hayes confirm
this —

256 C' 2". 1000 cc jars
5/8 hole

~~20~~ Zero. Don't hear.
turned to 2 3/8 hear to 20"



at 15 1/2 sharp get fundamental
9 quiz. hear to 20"
There is no 5 1/2 overtone in rod,

2nd Resonator in, 15 9/16 the 1st
[illegible]

Boys always listening to 2
Rod much louder
Ott says when not listening with
tube outside never strong
but sometimes hears any noise
from tube with free piece

Boys outside hears no auto
with tube. Can't hear auto

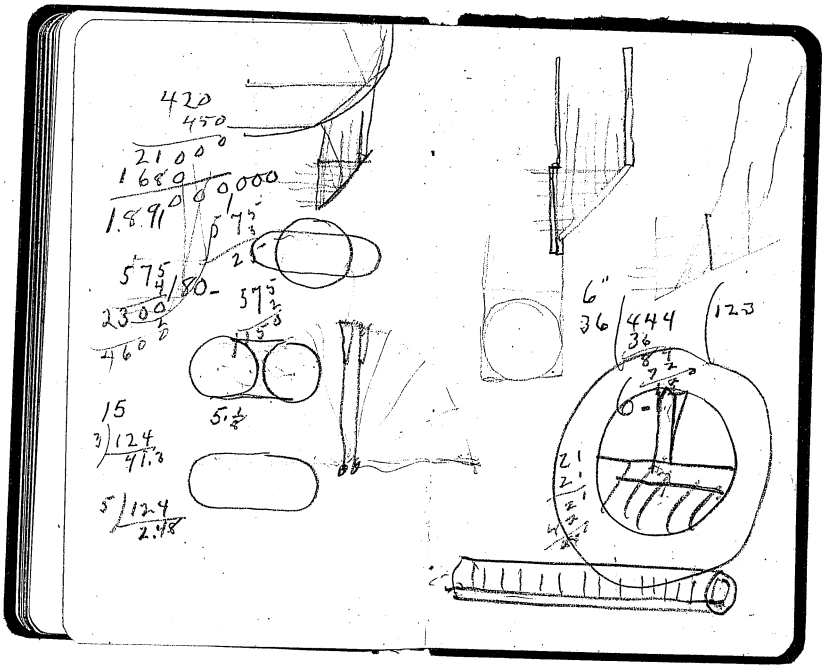
Continued in
#3 Lab Note book

$2\frac{1}{4}$ 1st

~~[illegible]~~ 15" 5/4
Then is should be (doubtful
louder than $2\frac{1}{4}$
& is exact tone of
256 mid C –

Exact is 2 7/32 & $2\frac{1}{4}$

18 | 125 – 8
| 16


420
450
21000
1680
1.891
575
2300
460
15
124
41.3
5
124
2.48
6"
36
444
36
123